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SPECIAL FEATURES

THE MORGANTOWN CRASH
FRENCH AVIATION IN 1921
"WHO'S WHO IN AMERICAN AERONAUTICS"
AIRPLANE PERFORMANCE AND DESIGN CHARTS
DIRECTORY OF AIR SERVICE ACTIVITIES

THE GARDNER, MOFFAT CO., INC.
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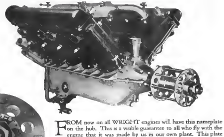

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Aeronautical Legislation

ALTHOUGH the United States is still awaiting the coming of national legislation for the regulation of air navigation which would bring order into what is now chaos, it cannot be said that bills tending to remedy this state of affairs are wanting. In fact, there is right now a maze of proposed aeronautical legislation before Congress. The various bills that have been introduced at this session often overlap on one another's scope to such extent that the result must be extremely confusing to our lawmakers.

Not only have bills been presented which propose the creation of separate departments, but commissions, boards and bureaus have been proposed, all of which more or less answer the same purpose. All kinds of regulatory measures have been introduced as well as many special bills calling for all sorts of apropriations from the purchase of aircraft patents to the permanent housing of the NC-4.

It would really require a lawyer's full time to read and to consider carefully all these measures. What will come out of them seems problematical. For the time being the various bills rest in several committees. Some important "riders" have also been attached to appropriation bills. All this tangle can only be handled successfully by having Aviation Committees in both Houses and the sooner these are authorized, the quicker will there be an intelligent consideration of aeronautical laws.

The Lesson of Morgantown

THE Morgantown crash, the worst that has ever occurred in the history of American flying, should serve as an urgent warning to our lawmakers that no time should be wasted in the enacting of such legislation as aviation requires for the safety of those engaged in its pursuit.

It is merely a repetition of what we have so often expressed in these columns to say that air navigation in order to achieve safety needs chiefly two things: a well planned net of airways and a comprehensive system of weather forecasting. Lack of suitable landing fields often forces aviators to jeopardize their safety by coming down on most unsuitable sites. Lack of reliable weather forecasting keeps them in ignorance of the atmospheric conditions they will meet en route. The two factors combined make a poor insurance for safe flying.

The Morgantown disaster was probably due to both of the above named causes. While it is possible that an emergency landing field may not have saved the Eagle from crashing, an accurate weather forecast, reaching Langley Field in time, would have prevented the take-off of the ill-fated airplane. The fact that all the machines which took off at that time flew straight into a terrific gale, from the effects of which even an extremely maneuverable single-seater was wrecked, would seem to show that the weather was chiefly responsible for this lamentable accident.

It is therefore gratifying to learn that the United States Navy, in cooperation with Weather Bureau, has decided to issue daily weather forecast bulletins which will be available to all who fly. This measure is however only a modest beginning. To begin with, the bulletin, which since June 1 is being sent out from the radio station at Arlington, covers only the eastern half of the United States and Canada. Second, it will be available for prompt use only on airdromes equipped with a radio station—and these are extremely few in number. Third, an aviator may start several hours before the bulletin is issued (at 10 a. m.) and so fly into a fierce gale unless the ground stations over which he may fly can warn him in time. This would seemingly make it desirable for air ports to fly storm signals such as are customary in harbors. Passing aircraft could then take heed of the warning in time and land. Finally, without meaning to minimize the very laudable efforts of the government agencies organizing this service, it seems awkward that it should require three separate government departments—the Navy, the Weather Bureau and the Signal Corps of the Army—to issue weather forecasts to fliers.

Regardless of these minor points, however, the issuing of daily weather forecasts is bound to prove of the greatest benefit to fliers, one of which they should take the fullest advantage, for it is another step forward toward greater safety.

No More Civilian Stunting

AMERICAN civilian aviation, which had been comparatively free from serious accidents ever since the termination of hostilities permitted the resumption of peaceful activities, recently experienced a regrettable series of fatal accidents. Barring very few instances, the real cause of these fatalities was stunting in all of its forms.

It is practically impossible to draw a line between what is safe and what is unsafe in stunting. Consequently, the only sensible measure that will prevent a repetition of such accidents is the absolute prohibition of civilian stunting, be it over public airdromes or elsewhere.

Pursuit pilots have to be trained in stunting because aerial fighting requires it; but commercial pilots need not and should not stunt transport airplanes, for the temptation is too strong to do it needlessly. Nor are masters of acrobatics of necessity the most desirable commercial pilots. Judging from European experience, the contrary seems rather to be the case. The British and French air lines employ former bombardment pilots in preference to pursuit pilots because the former's staying power is of greater importance for commercial aviation than brief flashes of brilliancy.

What American commercial aviation needs in order to gain the confidence of the public is safe and sane flying; not stunting. Hence stunting of civilian aircraft should be prohibited, as it is in Canada and Great Britain.

The Morgantown Crash

Aviation and Aircraft Journal deeply regrets to have to chronicle by far the worst accident that has yet befallen American aviation. On Saturday, May 28, a Curtiss-Eagle ambulance airplane of the Army Air Service which was flying from Langley Field Hampton, Va., to Bolling Field, Washington, D. C., was caught in a violent electrical and wind storm and crashed near Morgantown, Md. The seven occupants of the machine, all of whom were killed, were:

Col. Archie Miller, Air Service, General Staff College, holder of the Congressional Medal of Honor,

Maurice Connolly, representative of the Curtiss Aeroplane & Motor Corp in Washington, D. C., a Major in the Air Service during the war and formerly a member of Congress from Iowa;

A. G. Batchelder, chairman of the executive board of the American Automobile Association and member of the board of governors of the Aero Club of America;

2nd. Lieut. Stanley Ames, Air Service, of Bolling Field, pilot of the Curtiss-Eagle;

2nd Lieut. Cleveland W McDermott, Air Service, of Langley Field;

2nd Lieut. John M. Pennewell, Air Service, of Langley Field;

Sergt. Richard Blumenkrans, Air Service, of Bolling Field.

Col. Archie Miller, Air Service, U. S. A.

On Routine Flight

The big ambulance airplane and four smaller craft left Bolling Field early Saturday morning for a round trip practice flight from Washington to Langley Field. Those flying the airplanes and the guests aboard the Curtiss-Eagle made the trip also to witness the review of the fully organized air brigade which is to take part in the army and navy bombing tests off the Virginia Capes late in June. Langley Field is 140 miles in an air line south of Washington.

The Curtiss-Eagle was under the command of Lieutenant Ames. In addition to Mr Connolly, Mr. Batchelder and Lieut. Co. Miller there were aboard as guests Representative Philip P Campbell of Kansas, Representative Joseph Walsh of Massachusetts and Captain Guy de Lavergne, Air Attaché of the French Embassy at Washington. Representatives Campbell and Walsh and Captain de Lavergne made the return trip to Washington by night steamer from Norfolk.

At Langley Field two other passengers, Lieutenants McDermott and Pennewell, both of whom were formerly stationed at Kelly Field, Texas, were taken on board for the return trip to Washington.

The big airplane had been stripped of its ambulance accommodations for this trip and seats had been provided for the passengers.

The distance of 180 miles down the valley of the Potomac past Mount Vernon, Gunston Hall and other historical Colonial homes, was made without mishap by the ambulance airplane.

Ran into Storm

The airplane had covered 120 miles of the return trip before running into a storm which nearly played havoc with four other army airplanes, including one in which Brig Gen William Mitchell, Assistant Chief of Air Service, was engaged in a round trip flight, between Bolling and Langley Fields. The returning planes were in the vicinity of Indian Head, Md, where one of the naval proving grounds is located when they ran into the storm.

Captain Bardett S. Wright, an aid to Brig Gen. Mitchell, who was flying a Fokker pursuit plane from Langley Field to Bolling Field, was caught in the same electrical storm and forced to make a landing at Rock Point, on the Potomac River, where his plane was damaged.

Brig. Gen. Mitchell, flying an S E-5 pursuit plane, and Captain William C Ocker of Bolling Field were caught in the edge of the storm, but managed, after great difficulty, to ride out of the gale and return safely to Bolling Field half an hour after the accident to the ambulance airplane occurred.

An airplane commanded by Captain Turner of the Marine Aviation Service was caught in the storm and forced to land at Quantico, being unable to make its way through to Washington.

What happened inside the Curtiss-Eagle when the airplane struck the storm over the Potomac may never be known. That the time of the crash was 6-25 P. M. is indicated by the fact that Mr Connolly's watch, when found, was stopped at that moment. While the accident was witnessed from a distance both by persons stationed at the naval proving ground at Indian Head, on the Potomac, and on board the naval yacht Dolphin, it is understood that only one person, a native, reached the scene of the accident in the early hours of the evening

Those at Indian Head who saw the plunge say that the pilot appeared to endeavor to bring the airplane to earth be-

fore the storm in its full fury could strike. Lieutenant Ames was seen to circle the vicinity three times evidently looking for an open space to land. This, he found but in landing was probably caught by a sudden upward gust which caused the airplane to dive perpendicularly.

General Mitchell said that he attached no blame whatever to Lieut. Ames, the pilot of the big plane, and asserted that no plane in the world would have been able to ride out the storm in which the airplane was caught.

Praises Work of Lieut. Ames

"Lieut. Ames was one of the ablest of the younger pilots in the service," said Gen Mitchell "He was engineer officer and test pilot at Bolling field, and had taken this plane into the air before He made a splendid flight with the big Eagle yesterday morning from Bolling field to Langley field. He has been serving as test pilot at Bolling field for about a month, and comes from Boston. During the war he entered the air service from civil life, and got to England during the closing months of the war. He is one of the men taken into the air service during the war who have been commissioned in the regular army under the provisions of the army reorganization act of June 4, 1920."

Colonel Miller's Career

Colonel Miller was born in Chicago on Sept. 23, 1878. He attended the public schools of the city He was an A. B man of St. Mary's College, Kansas, and St. Louis University. At the outbreak of the Spanish-American War he enlisted with the State volunteers and saw service in Cuba, reaching the rank of First Lieutenant. In 1899 he went to the Philippines for a year, transferring later to the regular army cavalry The action which won for Colonel Miller the Congressional Medal took place on Tian Island on July 2, 1909. The Americans were opposing hostile Moros, and Colonel Miller, under heavy fire, with the assistance of enlisted men, placed a machine gun in advance of its former position, at a distance of about twenty yards from the enemy.

Maurice Connolly

When the United States entered the World War, Colonel Miller was assigned to the Air Service with the rank of Lieutenant Colonel and was sent to Kelly Field as commanding officer He subsequently was commanding officer at the aviation camp at Waco, Texas, and Camp Greene, North Carolina. In July, 1918, he was put in charge of all air service activities at the several training camps established on Long Island.

After the armistice Colonel Miller was appointed as assistant to the Director of Military Aeronautics. Later he was in command of Air Service activities on Long Island. In February, 1920, he returned to his old post of commanding officer at Kelly Field, Texas, for a time At the time of his death he had just completed a course at the General Staff College in Washington, in which he graduated with high honors. He is survived by a widow and several children.

Connolly's War Service

Maurice Connolly was born in Dubuque, Iowa, and at one time represented his district in Congress. During the war he was a Major in the Air Service, being assigned at various times as executive officer at Wilbur Wright Field, Fairfield, Ohio, recruiting officer at Hazelhurst Field here and to the office of the Chief of Staff of the Air Service. He was graduated from Cornell University and took post graduate courses at Oxford College England, and the University of Heidelberg. Connolly was born in 1877 He was unmarried.

Mr Connolly was a regent and member of the Executive Committee of the Smithsonian Institution, and had many business connections in Iowa. He was a delegate-at-large to the 1916 convention of the Democratic Party. His clubs were the Aero Club of America, the National Press Club and the Metropolitan.

Mr. Batchelder was a former newspaper man and was a native of Utica, N. Y, where he was born forty-eight years ago. He was at one time editor of Motor, and it was while serving as such that he organized the American Automobile Association, which grew under his leadership to an organization of large size and influence. Mr. Batchelder had made his home in Washington since the Automobile Association opened national headquarters there.

Lieut. Ames Once Held by Mexico

Lieutenant Stanley Ames had been an aviator for several years. Enlisting in the British Army at the outbreak of the war, he later transferred to the American forces in France. In June of last year he made a forced landing on Mexican territory and was held by the Mexican authorities at Matamoros. His release was ordered by General P. Elias Calles, Mexican War Minister. Lieutenant Ames was testing officer at Bolling Field, just outside of Washington, and was regarded as an authority on aero engineering and testing.

Lieutenants McDermott and Pennewill were stationed at Langley Field, to which they were recently transferred from Kelly Field, Texas, for the forthcoming joint army and navy bombing tests in June. Lieutenant McDermott, who came from Syracuse, fought in France and was officially credited with bringing down three German planes. The French awarded to him the Croix de Guerre and the Medaille Militaire. He likewise received the Distinguished Service Medal.

Speaking for the membership of the Aero Club of America, Maurice Cleary, managing director, said:

"The loss of these men, all of whom were members of the club, is a national one. Colonel Miller, Mr Connolly and Mr. Batchelder were leaders in aeronautical development in this country and their places will be hard to fill. Believing so much in aviation that they were willing to fly, they were indeed martyrs to a great cause—the development of the airplane as a mode of carrier."

Investigation Started

As soon as the accident became known in Washington the Chief of Air Service ordered a thorough investigation into the causes of the accident. The findings of the special board appointed for this purpose have not yet been made public.

Statement by the Curtiss Co.

The following statement relative to the Morgantown crash was issued by C M. Keys, president of the Curtiss Aeroplane & Motor Corp.

"I have notified the proper officers of the Government that we desire a full investigation into the character of the Eagle and that we hope the findings of this investigation will be made public.

"We have complete faith in the ship, and are willing to rest upon the testimony of the many Army and civilian fliers who have flown it during more than a year of safe and successful operation."

Following the receipt of a report on the Curtiss-Eagle accident, made by W L. Gilmore, chief engineer of the Curtiss Aeroplane & Motor Corp, Glenn H Curtiss authorized the following statement:

"This accident reveals with tragic emphasis the chaos in which American flying is involved It would not have occurred had there been in existence a properly charted route and sufficient emergency landing fields, or if, lacking these, the properly centralized machinery for gathering and disseminating storm warnings had been in existence and functioning We must coordinate our flying and place it under responsible control.

"W L. Gilmore, chief engineer for the Curtiss Aeroplane & Motor Corp, after conferring with Army officers and others has submitted his report Judged from the condition of the wrecked plane, from the testimony of witnesses and from the experience of Capt. B S. Wright, during the same storm, the following appears to have occurred

"The Eagle was in perfect flying condition All controls were intact and in working order On the trip to Langley Field it carried about 2,400 lb useful load and on the return about 2,000 lb Its maximum capacity is over 4,000 lb Therefore the machine was not overloaded The gale was blowing at probably 90 or 100 m p h The pilot searched for a place to land Although the route between Langley Field (Hampton, Va) and Bolling Field (Washington) is heavily traveled, the route is not charted and no emergency landing fields have been established Consequently the pilot, fighting the storm, had to make the best landing possible under the circumstances He circled Morgantown, headed into the gale, throttled his engine and approached a field surrounded by heavy trees 30 or 40 ft. high. The velocity of the wind was so terrific that the crests of the trees were bent over like wheat.

"What occurred then is deduction. Captain Wright, with a light, maneuverable and heavily powered plane, skimmed the bowed tops of the trees surrounding another field about seven miles distant He reports that the gale, flowing over the cleared ground and up and over the trees, created an air current similar to a huge and powerful swell at sea His plane at first dipped, then rose, then was caught under the tail and sent diving earthward This plane, a Fokker has such speed and such maneuverability, that it was possible to right it partly before it struck. The result was that only the undercarriage was swept off Still having flying momentum, Wright rose, then dipped and landed on his nose, but with such reduced speed as not to seriously injure himself, although his plane turned turtle and was wrecked.

"From Captain Wright's experience, under similar circumstances, it is believed that the Eagle, coming over the treetops, encountered the upward stream of air The pilot undoubtedly increased his power and elevated the plane The terrific gale then must have caught the Eagle under the tail and sent it nose down Although not overloaded the Eagle because of its size, was slower than the Fokker to respond to the controls, with the result that it crashed to the earth at a speed of probably over 100 m p h"

Awards for Navy Shipboard Planes

Secretary Denby has approved the final awards under the navy competition for designs for airplanes to be used aboard naval ships. The first award goes to the Dayton-Wright Co, whose designs will be purchased for $16,000 The second award goes to G. Elias & Brother, Inc, who will receive $10,000 for their design The third award is made to the Curtiss Aeroplane and Motor Corp., whose design will be purchased for $5000 and the fourth award to Alexander Klemm, whose design will be purchased for $3,000

The board which passed on the designs was composed of Commander Jerome C. Hunsaker, Construction Corps, Aviation Section, Lieut. Commander Sidney M Kraus, Aviation Division, Bureau of Engineering, Lieut. Commander Wadleigh Capehart of the Material Section, Naval Operations (Aviation), and Lieutenant Raymond D MacCart, Construction Corps, Aviation Section, as Recorder.

The board states that in its opinion while useful information has been obtained from all five designs and the competitors have shown a praiseworthy zeal in attempting a difficult problem, the designs of the Dayton-Wright Company and G Elias & Brother, Inc, are sufficiently promising to warrant experimental construction at this time, and the board recommends that negotiations with these firms be made at once with a view of arranging a contract for the construction of sample airplanes for experimental flying tests on shipboard

It is expected that these planes will solve the difficult problem of providing the navy with shipboard planes for taking off and landing on ships and also on the surface of the water.

How the Iowa Will Be Bombed

Among the bombing tests of warships to be conducted jointly by the Army and Navy forces the latter part of June and the first part of July, the most spectacular and interesting from the public viewpoint will be the search problem and accuracy of bombing test on the radio controlled battleship Iowa, scheduled for June 28

In one respect war conditions will be accurately simulated in this problem. for the old Iowa, under the control of a distant ship, will maneuver as an enemy ship, just as though she had a crew on board, except that her speed will be somewhat reduced Starting at a point somewhere between fifty and one hundred miles at sea off the Virginia Capes, the Iowa will steam toward shore while the planes from shore, starting at the same hour, will fly out to locate her When this is accomplished, the bombing with dummy bombs will begin.

For this operation the Army will use only the seven seaplanes it obtained from the Navy and four airships, all of its land planes having been withdrawn from this test The Navy will have four of the NC type of flying boats and twelve F-5 Ls in the search problem and four Martin bombers, land planes, aiding in the accuracy of bombing tests The Navy airships probably will take part in the search problem

In order to use the Iowa for a moving target, she has been fitted out with special apparatus that will enable her to be controlled by wireless from a ship at a distance

Aerial Transport Corp.

With the opening of temporary offices at 505 Fifth Avenue, New York, the Aerial Securities Co is undertaking the reorganization and financing of the Aerial Transport Corp, which was incorporated about eighteen months ago for the operation of air lines between important cities W L. Brackett is President of the Aerial Securities Company and Vice President of the Aerial Transport Corporation

Inability to secure commercial types of transport machines during the past year has, it is understood, been the principal reason why operations have been delayed until now The Aerial Transport Corp is keeping in close touch with the development of several new American commercial machines designed for carrying loads of 1000 lb or more. One of the most promising is the twin Liberty transport machine of the Airliner Engineering Corporation of Amityville, L. I, which will have its test flights before long Mr Brackett states that this machine will be placed in production for his company after thorough tests have been made

Growth of the Aircraft Industry

The preliminary statement of the 1920 census of manufacturers issued by the Bureau of The Census, Department of Commerce, shows aircraft and aircraft parts to have increased in value from $24,246,435,000 in 1914 to $62,588,005,000 in 1919 The number of establishments engaged in aircraft production increased from 16 in 1914 to 31 in 1919.

French Aviation in 1921

By Captain de Lavergne

Air Attache French Embassy, Washington

France is endeavoring more and more to put into practice what General Hirschener expressed when addressing the French Senate he said "We should no longer say *Si vis pacem, para bellum* (If you want peace prepare for war) but *Si vis pacem serra coelum* (If you want peace, hold the sky)"

To utilize all the resources, material and skill available in France, to make all the sacrifices necessary, to initiate an active program, not merely of regulations and projects, and to create with faith and determination a commercial and military aviation, is the policy adopted by the French authorities.

Two years ago this seemed a dream, but the time has now come when the efforts made since are beginning to be rewarded

This is due to General Duval, former Commander of French Military Aviation, a man of broad intelligence, who, as soon as the war ended, endeavored to prepare the field of commercial aeronautics and succeeded in centralizing all aviation activities in one office, the Technical Section His successor, Mr Flandin, respected the first steps that had been taken, knowing that to change in order to rebuild is not a wise policy Once more the office of the Under-Secretary united the military and private activities in its Technical Section. Mr Laurent Eynac, the second Under-Secretary of State followed the same policy with energy and determination Owing to these three men, French aviation is in my opinion certainly ahead of all others. This is not vain pride. We are merely pursuing the realization of a plan adopted two years ago, for we are convinced that nowadays aviation is as vital for a great nation and for her traffic as railroads and waterways have been and still are.

Everyone knows that France, confronted with numerous problems of national security, with one door open to the Sea and another to the East, is obliged to maintain an army and therefore military aviation, as long as the peace of Europe is not assured Let us examine how the problem of the military plane can be handled

Military Aviation

The military machine must be easy to get off and to land, be maneuverable, and, where bombing is concerned, capable of carrying huge loads.

If we call P the gross weight of the machine (plane, crew, armament, fuel)
S the surface of the wings in sq m.
π the power expressed in hp

the interesting elements of the problem are $\frac{P}{S}$ or the load per square meter and $\frac{P}{\pi}$ the weight per hp.

I Getting off. Landing

To get off easily $\frac{P}{S}$ and $\frac{P}{\pi}$ must be as small as possible.

To land, $\frac{P}{S}$ must be small

II. Maneuverability (or Lightness and Excess of Power)

a) Necessity of great speed in going down $\frac{P}{s}$ great

b) Necessity of rapid climbing $\frac{P}{\pi}$ small

c) Turn quickly $\frac{P}{\pi}$ small

III. Capacity for carrying huge loads

The weight P of the machine can be written as follows

$$P = Pu + Pa + p\pi + PC$$

in which Pu is the useful weight, Pa the weight of the plane without the engine, π the power of the engine, p the weight per hp, and PC the weight of fuel

But Pa is a fraction of the total weight, which is the greater as the coefficient of security is higher We can therefore write

$Pa = B \times P$, B depending upon the coefficient of security

Pc represents the weight of fuel necessary for a flight of n hours, if we assume that PC is proportional to the power of the engine we can write

$Pc = np'\pi$ (p' consumption per hp./hr) and the weight P of the machine is.

$$P = Pu + BP + p\pi + np'\pi$$

$$\text{or } \frac{Pu}{P} = 1 - B - \frac{(p + p'n)}{\frac{P}{\pi}}$$

But $\frac{Pu}{P}$ represents the capacity of the plane and we see that to increase it we have to diminish:

(1) B, to diminish the coefficient of security

(2) p or p' (in improving the motors p is now 1 kg. p' 215 g.)

(3) n, the number of hours of flight endurance) or else we must increase the weight per hp., which involves a decrease of the ceiling, the horizontal speed and the rate of climb

From the foregoing it is easy to see, how difficult is the problem of the military plane of the future It would seem as though we had reached the limits of progress during the war in conciliating the various elements of the problem, so that the improvements effected in one might not react unfavorably on another

Undoubtedly the problem varies with every kind of plane and it is probably easier to improve a pursuit plane than a commercial or bombing plane. Progress in speed, rate of climb, ceiling is being made every day. At present we are testing a new pursuit plane, which we hope will attain a speed of more than 300 km.p.h. (200 m p h) This machine, a Morane, will be with the Nieuport 300 hp, the fastest pursuit plane in the world

The bombing machines are studied with no less care A four-engine heavy bombardment plane is now nearly completed The fact is not overlooked that the heavy machines must satisfy many of the contradictory factors of efficiency. If we look at the efficiency formula given above, we see that the improvement of heavy aircraft can only be brought about by an improvement of the engine, since it is unwise to tamper with the coefficient of security and to sacrifice endurance, ceiling and rate of climb. When building a high capacity plane it is out of the question to give it a low ceiling, low speed, etc., though many engineers, considering the importance of the load carried, seem to forget that, to a certain extent such an improvement involves the loss of all the military qualities of the machine That is the reason why we do not build immense machines, to be discarded in time of war and why we direct our commercial enterprises not to use planes carrying more than six passengers.

This applies to land planes. It is obvious that this is not true of flying boats, which are necessarily heavy and to which, in spite of the skill of the engineers, military efficiency can hardly be attributed. That is if we compare them, from this

point of view only, with land planes. It may be said that it will be an easy matter with a modern land pursuit machine to bring down these marvels of construction such as the NC boats, even when they are armed with nine machine guns. In spite of this we now have the Besson 1000 hp. Salmson flying boat, the Latham 1000 hp Salmson, and we are considering the construction of the 2400 hp Paumier.

Civil Aviation

It is not necessary to discuss further the necessity of centralizing in the same laboratories all aeronautical governmental engineering. It is lack of liaison that always weakens all activities in any field of science. If everyone in the world spoke the same language and if there were one bureau for each branch of scientific research, composed of all the leading specialists in the world in that line, we would have made much greater strides along scientific lines. This not being the case, we are at any rate satisfied with our innovations.

The Work Accomplished

In 1920 ten commercial aviation companies succeeded in maintaining regular traffic in France. The following table gives an accurate idea of their work.

FRENCH COMMERCIAL AVIATION ACTIVITIES IN 1920

LINES	Number of Trips	Kilom	Passengers Paying	Passengers Non Paying	Freight (Kilogs)	Mail (Kilogs)
Paris-London	614	247,608	470	221	33,516	346
Paris-Brussels	165	66,605	172	105	336	66
Paris Cabourg (1) (resort)	23	11,635	41	6	662	
Paris Strasburg-Prague (2)	116	56,870	16	62	563	
Paris Geneve	12	5,670	6	0	66	70
Toulouse-Casablanca (Morocco)	307	267,030	126	66	10,100	6 636
Bayonne-Bilbao (Spain)	166	22,216	36	67		
Bordeaux Toulouse-Montpellier	674	64,620	60	66	1,831	
Nimes-Nice	66	16,425	7	16	215	
TOTAL	2 670	482,650	942	740	49,940	3 868

Comparison between the Paris-London English and French Lines in 1920
British 4630 passengers or 91 per cent
French 470 passengers or 9 per cent
Comparison between 1919 and 1920

1919
260,000 kilometers flown 100 passengers carried

1920
630,000 kilometers flown 1,000 passengers carried.

(1) Operated only during the fashionable summer season, Cabourg being one of the most popular among the bathing resorts of France.
(2) Since November 1920, date of the inauguration of the service.

Capital Invested

The capital of the private companies is on an average 2 million francs, excepting that of the Compagnie Franco-Roumaine which disposes of 10 millions and the Compagnie Aérienne Française which specializes in commercial aerial photography and which has the same capital. The number of planes is from 10 to 20 machines, although the Latecoere Co. which operates the Franco-Morocco air line, possesses 60 machines and the Franco-Roumaine 31.

French commercial aviation has in all 185 machines and 72 pilots.

Accidents

There has been 1 accident for every 85,000 kilometers flown, 1 death for every 170,000 kilometers flown, 1 injured for every 170,000 kilometers flown; in all 7 killed and 7 injured.

In 1920 of a total of 128,000 travelers by train and boat there were 185 accidents, resulting in 13 deaths, for the 34 million kilometers covered.

Cost Computed by the Companies

The cost of operating these air lines is computed at 10 francs per kilometer for 300 hp. single engine plane and 15-16 francs per kilometer for airplanes fitted with two 260 hp engines.

Passenger Rates

Paris-London	300 francs, reduction of 300 frs. formerly 500-700
Paris-Brussels	150 francs, reduction of 150 frs. formerly 300
Paris-Strasburg	250 francs, rates reduced by half
Paris-Prague	750 francs, rates reduced by half
Paris-Geneva	450 francs, rates reduced by half
Toulouse-Morocco (through Spain)	1589 francs, no reduction
Bayonne-Bilbao	250 francs, no reduction
Toulouse-Montpellier	230 francs, no reduction
Nimes-Nice	300 francs, no reduction

Aerial Ports

Le Bourget 30 kilometers from Paris
Orly 50 kilometers from Paris
Monbauge 150 kilometers from Paris
34 hangars were built in 1920, also 2 airship hangars.

Meteorology

12 wireless stations;
22 meteorological stations;
7 searchlights.

Subsidies Granted by the State

Each company receives a subsidy that accomplishes one daily trip up to 150 km from the French border, or one tri-weekly trip more than 250 km. from the frontiers, provided, however, that each company has the number of machines required by the following formula:

$$n = \frac{h}{200} \times 2$$

h being the total number of hours flown during the year at a rate of km.p.h ; the company is, then, entitled to receive:

1°) a purchasing bonus:

$$\frac{P + 1.5p}{200}$$

P being the price of the cellule (or 1050 francs per sq.m.)
p being the price of the engine, (60 to 130 francs per hp.)

2° a bonus per hour $\left(Em + \frac{nHP}{2}\right) \times 10$

Em = average trip in kilometers
nHP = power

3°) a bonus for transportation, $\frac{KV^2T}{1000}$

K varying from 11 to 23
T = load carried in tons
V = speed in kilometers

4°) a bonus for gasoline

the price of the liter being $nHP \times \frac{p}{2} \times \frac{0.250}{0.65}$

nHP = power
p = price of the engine

Each company must have one pilot for each three planes and one mechanic for each 300 HP

The appropriations voted this year for the payment of these subsidies amount to 20 million francs, and the general budget of Civil Aviation comes to 184,683,000 francs.

The increase in traffic since 1919 gives promise of the successful operation of our aerial lines for the present year. Owing to the new regulations put in effect by our far-sighted authorities, the British transportation companies, which during 1920 have absorbed 91 per cent of the traffic are no longer able to compete with the low prices of French transportation.

Next year there will be carried out the program of the new commercial planes which will be divided into passenger planes, mail planes, touring planes, each of them having to meet rigid specifications imposed by the Under-Secretary of State. The year 1921-1922 will also see the creation of a great aerial port at Marseilles and one in Constantinople, the first marking the beginning of French influence in the direction of Africa, the second toward the Orient.

Cloud-Flying Instrument Board

The following article describes the experience of Lt. John P Van Zandt of the A. S Engineering Division, Dayton, Ohio, in a recent flight from Dayton to Washington in which the value of certain cloud-flying instruments was demonstrated

One of the problems of the Navigation Branch of the Engineering Division is to make possible regular scheduled flights regardless of weather conditions. On the aerial highway between Washington and Dayton, Ohio, unfavorable conditions are often met with over the Alleghenies. Recently, the weather has been so consistently unfavorable that two of the Martin Bombers from Dayton on their way to Langley Field have been held at Moundsville, W. Va., for several days waiting for good flying weather.

A DH-4B from the Navigation Branch, however, was able to complete the flight from Dayton to Washington recently on schedule time regardless of fog and storm, primarily because it was equipped with an experimental cloud-flying instrument board. The instrument board in question does not comprise any new or novel idea but is simply a very compact arrangement of turn indicator, lateral and fore and aft inclinometers and compass mounted directly before the pilot on a special board in the position where the compass is usually mounted. The turn indicator is wind-driven by means of a Venturi tube fastened to one of the center section struts. The particular board in question was primarily designed to enable the plane to be flown straight and level during sextant observations.

On the particular flight when this instrument board proved invaluable the plane left Moundsville in company with the two Martin bombers about 2 30 p m. and headed southeast in the direction of Washington. After flying about 15 minutes at a ceiling of approximately 1000 ft., the formation ran into wisps of fog and, although the planes were flying fairly close together, they disappeared from each other's sight completely for the moment. The sky ahead was very forbidding and it was obvious that it would be necessary to go up through the storm in order to get across the Alleghenies or else turn back.

At this point the DH parted company from the Martin bombers and entered the fog, losing complete sight of the ground and every fixed landmark. The air was very rough and in a few minutes, the plane had swung completely off the course and was found to be pointed almost west when righted again. It was obvious that complete reliance would have to be placed on the cloud-flying instrument board if the plane was to be kept on an even keel or if any pretense was to be made toward following a given course. After some disagreeable minutes getting on to the knack of flying with one's head in the cockpit, the plane was set on its course and headed 20 deg southeast and at a steady drive with nothing to be seen but the great white fog which completely enveloped the plane. Before climbing very long, the drift wires became loaded with sleet and snow, the air speed meter froze up and indicated 35 m p.h. and the plane became so heavy that it was impossible to climb above 10,000 ft. The plane was actually sinking through the air and still there was no indication that the top of the fog had been reached

It was decided to motor down slowly for by this time the Alleghenies must have been crossed. After an hour and a half of the fog, the machine at last emerged, fortunately right on the course and a few miles west of the Blue Ridge Mountains which were crossed at an altitude of 500 ft. and, picking up the Potomac, followed it into Washington, landing shortly after 5 p m.

This was the only plane which successfully completed the flight of the four which started out that afternoon. It is safe to say that the trip would have been impossible without the use of a cloud-flying instrument board or at least the instruments which go to make up such a board. There is no question that it is impossible to maintain equilibrium long in a dense, bumpy fog without the use of instruments, whereas an attempt to follow a given course is entirely out of the question under such circumstances. It is, however, equally clear that with the proper installation of a turn indicator, bubble inclinometers and adjusted compass, any desired course can be maintained for indefinite length of time in any kind of weather.

The standardization of a compact group of cloud-flying instruments should prove invaluable under general service conditions. It is undoubtedly true that many of the accidents and fatalities which have occurred in aviation have been due to this very same difficulty of flying in an even keel in thick fog. It is not at all unlikely that the recent accident at Langley Field was due to this very thing. Unfortunately, most of the accidents which occur from pilots becoming confused in a fog result in fatalities so that the victims of the situation are not able to testify to the need they had for cloud-flying instruments. It is hoped before long that the Engineering Division will be able to specify a standard group of cloud-flying instruments, and that all pilots who ever have occasion to fly in thick weather will have available means to prevent such cloud-flying accidents as have occurred in the past.—*Air Service News Letter*

Properties of Aerofoil Sections

N.A.C.A. Report No 93

The object of this report is to bring together the investigations of the various aerodynamic laboratories of this country and Europe upon the subject of aerofoils suitable for use as lifting or control surfaces on aircraft The data have been so arranged as to be of most use to designing engineers and for purposes of general reference. It is the purpose of the Committee to publish all existing tests on aerofoil sections, and present this information in a new form.

The absolute system of coefficients has been used, since it is thought by the National Advisory Committee for Aeronautics that this system is the one most suited for international use, and yet is one for which a desired transformation can be easily made. For this purpose a set of transformation constants is included in this report.

Each aerofoil section is given a reference number, and the test data are presented in the form of curves from which the coefficients can be read with sufficient accuracy for design purposes. The dimensions of the profile of each section are given at various stations along the chord in per cent of the chord using as datum the line shown on the curves. The shape of the section is also shown in reasonable accuracy to enable one more clearly to visualize the section under consideration together with its characteristics. The more accurately to obtain the dimensions of the profile of each section, a separate data sheet for each section has been included, which gives an additional decimal place for the greater portion of the ordinates.

The authority for the results here presented is given as the name of the laboratory at which the experiments were conducted with the size of model, wind velocity, and data of test.

Three separate indices are given—a chart index which makes it possible for a designer to select the wing section most suitable for a particular design he is interested in, a group index which is arranged in the same order as the curve sheets, that is, by countries and laboratories at which tests were conducted, each section also being designated by a reference number, and an alphabetical index

In order that the designer may easily pick out a wing section which is suited to the type of machine on which he is working, four index charts are given which classify the wings according to their aerodynamic and structural properties.

A copy of Report No 93 may be obtained upon request from the National Advisory Committee for Aeronautics, Washington, D C

Airplane Perfomance and Design Charts

By L. V. Kerber

Aeronautical Engineer, Engineering Division, Air Service

The subject matter of the present report is a graphical solution of an empirical-theoretical method of predicting the performance of an airplane, of which are known the weight, area, horsepower and external characteristics, and, by corollary, a method for determining the weight and area of an airplane of given horsepower and external characteristics, which is to be designed to realize a particular performance.

The example which serves as an illustration of this method, in order to be of practical value in this country, is consistent with the "Standard Atmosphere" adopted by the Engineering Division and with the shape of the lift/drag against lift curves characteristic of airplanes equipped with present day aerofoils. The method can of course be applied to the construction of charts consistent with any particular standard of atmosphere, such as the British, and applicable to airplanes equipped with any new type of aerofoil, such as the Handley-Page wing or the British "Alula" wing. It will be shown that the altitude functioning of a supercharged engine can be embraced by the present method.

The main variables entering into any consideration of airplane performance are the loading per horsepower, the loading per square foot of supporting surface, and one which will be called "fineness", and which will be a measure of the relative overall efficiency or lift/drag ratio of the complete airplane. For instance, if the "fineness" of one airplane is 100 and that of another is 120, it means that at any value of Ky common to both, the L/D of the latter is $(120/100)^3$ or $(1.20)^3$ times greater than the L/D of the former. Since the horsepower required is directly proportional to drag and hence inversely to L/D it means that at a given value of speed or of Ky and area, the second airplane can have a loading per horsepower $(1.2)^3$ times as great as the first airplane. The "fineness" which appears throughout this report is then always the cube root of the L/D of an airplane relative to the L/D of a certain basic airplane with a "fineness" of 100. The cube root of this ratio has been taken in order to confine the values to narrower limits, more easily interpolable, and the ratio has been multiplied by 100 so as to deal in round numbers.

Several purely empirical performance charts have been presented in the past, and they are practically worthless because of the omission of "fineness". For instance, these charts would give for the same loadings per horsepower and per sq. ft., identical performances for a large twin-motored bomber as for a small cleanly designed pursuit airplane, whereas it can be shown that the L/D ratio of the latter may be as much as 100 per cent greater than that of the former. Differences in high speed at the ground would in that case be of the order of 25 per cent. A further disadvantage is that these charts are not extended beyond the loadings in present practice. Purely theoretical analyses of performance have been prepared with unsatisfactory results as a reward for long and tedious mathematical manipulations. The conclusion of a recent work of this nature emphasizes the need of more complete experimental data on (1) wings, to determine the effects of various combinations, (2) parasite bodies, to determine the resistance coefficients of new shapes, (3) the effect of interference, (4) propellers, to determine the thrust and torque, (5) engines, to determine the drop-off in horsepower with increase of altitude.

Obviously the logical solution of this problem is by an empirical-theoretical method. The inadequacy of the empirical method may be overcome by taking into consideration "fineness". The difficulties of the theoretical methods may be obviated by empirically solving the effects of (1), (2) and (3) above, by blanketing them all under a factor such as "fineness". The explanation of the preparation of the charts will indicate in what manner the performance of the engine-propeller set at altitude may be found empirically and to what extent the theoretical equations of flight have been incorporated.

The method of this report consists, (a), in the construction of an empirical-theoretical chart for the determination of "fineness", engine-propeller performance, high speed at any altitude, and in the limit of the application, absolute ceiling; (b), in the construction of an empirical-theoretical chart for the determination of rate of climb at the ground, (c), in the use of an equation for time of climb to any altitude based on the theory that rate of climb is a linear function of the altitude, and (d) in the combination of the results of (a), (b) and (c) to construct, with the aid of cross-plotting, a performance and design chart. This final chart furnishes a complete picture of the variation at all altitudes, including ground level, service ceiling and absolute ceiling, of horizontal high speed, time of climb and rate of climb, of an airplane with a given engine and with any combination of the three variables, loading per horsepower and per sq. ft., and "fineness".

Speed-Altitude Chart

The fundamental chart which serves as a means for studying the "fineness" of airplanes and the functioning of the engine-propeller set at reduced density, is a speed-altitude chart

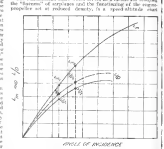

Fig 1

which is based on the definition of maximum horizontal velocity attainable at any altitude as the velocity at which the horsepower required by the airplane to overcome its resistance is equal to the horsepower available from the engine-propeller set. In constructing such a chart it is then necessary to study the variation of these features with altitude.

At zero altitude the horsepower required for a certain base airplane is known from a wind tunnel model test. For any other airplane it will be expressed in terms of its "fineness" in relation to the basic airplane. Horsepower available at zero altitude is known from dynamometer test and by assuming a propeller efficiency. At altitude, horsepower available drops off in a manner which is determined empirically. At altitude, horsepower required and also velocity depend on density, and these two variations are studied theoretically.

The presentation of all these considerations is graphical and takes the form of a series of corrections to the original loading

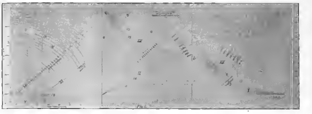

Fig. 2

per horsepower scale, which is used indiscriminately to represent both lb./hp. required and lb./hp. available, since for any particular solution they are equal. It will be understood that for any solution for velocity, the lb./hp. of the airplane under investigation is corrected for its "fineness" and by altitude considerations, so that it is changed into an equivalent lb./hp. of the basic airplane with "fineness" 100 and flying at zero altitude. In addition the velocity so found is corrected to be consistent with the density at the altitude at which the airplane under investigation is flying.

The DeH-4 is taken as the basic airplane in the example of this report. According to our definition of "fineness"

$$\text{(1)}\quad (\text{"fineness"}/100)^3 = (L/D)'_1/(L/D)_1 \text{ etc}$$
$$= (L/D)'_2/(L/D)_2$$

where $(L/D)'$ and (L/D), Fig. 1, correspond to the same value of Lm and where the primes denote any airplane other than the DeH-4. Then at any value of lift or Ky common to both airplanes, the drag' and hence the horsepower required' is inversely proportional to $(\text{fineness}/100)^3$. The horsepower required', HPr', if reduced to the HPr of the basic airplane becomes $HPr'\ (f'/100)^3$ and the loading per horsepower becomes $(\text{lb.}/HP')/(f'/100)^3$. In other words, if the "fineness" of an airplane is greater than that of the DeH-4, then the HPr of the DH-4 will be greater and the lb./HPr must be less, in order to attain any particular speed.

The following fundamental equations are of use in finding the desired relations

$$\text{(2)}\quad V = Vt \times SM \times (P/Lm)^{1/2}$$
$$\text{(3)}\quad HPr = DV/375 = PV/375(L/D)$$
$$\text{and (4)}\quad \text{lb./hp.} = P/HPr = 375(L/D)/V$$

where V = speed of full size airplane (m.p.h.)
Vt = speed of model test (m.p.h.)
Sm = scale of model
P = total weight of airplane (lb.)
Lm = lift on model (lb.)
D = drag (lb.)

The speed V found from (2) is used in (4) and the L/D of (4) and the Lm of (2) correspond to the same angle of incidence in Fig. 1. Equations (2) and (4) are solved for various angles of incidence from near zero lift to maximum L/D, and again for various values of the total weight of the airplane, the area being considered not to change. The relation between lb./hp., lb./sq. ft. and V is thus obtained and has been plotted in Fig. 2, curves I, where "a" is the speed scale, "b" is the lb./hp. scale and lb./sq. ft. is the parameter.

Next will be considered the effect of altitude on the disposition of curves I. At any constant angle of attack and hence constant value of Ky, the speed at altitude compared with the speed at zero altitude will be

$$\text{(5)}\quad Va = (1/\delta)^{1/2}\, V_0$$

where δ is the relative density at the altitude and equals d_a/d_0. The HPr at this altitude and speed will be

$$\text{(6)}\quad HP_a = (1/\delta)^{1/2}\, HP_0$$

scale "b" of lb./hp. is now plotted along scale "c" in such a manner that if we start from "c" and go vertically to the zero altitude line of curves II and then horizontally to "b", we would find there the same lb./hp. as at "c". Starting again from a point on "c", going vertically to the 5000 ft. curve, thence across to "b", we will have multiplied the lb./hp. of "c" by $(1/\delta)^{1/2} = 1.075$. Flying at a given speed at some altitude other than zero altitude is equivalent to flying with a heavier weight at zero altitude. The lb./hp. in terms of the basic airplane will be greater by $(1/\delta)^{1/2}$ and curves II effect this multiplication. In addition, the speed now found on "a" must be modified according to equation (5) and the curves III effect this multiplication by $(1/\delta)^{1/2}$. High speed is then read on scale "d" instead of on scale "a".

A further correction to lb./hp. is next applied and takes into account the effect of "fineness". As indicated above, the lb./hp. must be modified by multiplication with $1/(f/100)^3$. This is effected by curves IV in moving from scales "e" to "c". Starting from a lb./hp. of say 10 on a scale "e", moving to the right to a fineness of say 110 on curves IV, a vertical dropped to "c" would indicate a lb./hp. corrected for "fineness", of $10/(1.10)^3 \times 7.5$. Moving now vertically from curves IV to, say, the 5000 ft. line of curves II, we would find on "b" a lb./hp. of $7.5 \times 1.075 = 8.06$. Moving now to the proper lb./sq. ft. curve of I, thence vertically to the 5000 ft. line of curves III, thence to scale "d", we have the resultant high speed.

Lb./hp. has now been corrected for "fineness" and for altitude, and speed has been modified for altitude. There remains only to correct lb./hp. available due to the variation with altitude of the engine-propeller set performance. Scale "e" is first moved over horizontally to scale "g". Scale "h" is an altitude scale and scale "f" is an engine-propeler factor scale. Suppose we have a specific engine curve VI. Starting on "h" at say 5000 ft., moving to the right to curve VI we would find on "f" a factor less than unity which would represent the horsepower available from the engine-propeller set at 5000 ft. in terms of the horsepower available from the engine at zero altitude and with a propeller of 100 per cent efficiency. This means that to attain a given speed at 5000 ft., the lb./hp. available at zero altitude would have to be increased by 1/.66 if the curves I are to be used. The curves V of lb./hp. are so constructed as to effect this multiplication. So that now if we come from 5000 ft. on "h" to the proper engine curve VI, thence to the lb./hp.$_a$ at zero altitude on curves V, thence to the "fineness" on curves IV, thence to the 5000 ft. line of curves II, thence to the proper lb./hp. sq. ft. line of curve I, thence to the 500 ft. line of curves III, thence to scale "d", we will find there the high speed which it is possible to attain at 5000 ft. with the "fineness" and the loadings per horsepower and per sq. ft. of the airplanes investigated. The same procedure applies to all other altitudes.

TABLE I. FINENESS FACTORS

Airplane	Weight	Area	Hp. at ground	Lb /hp.	Lb /sq. ft.	High Speed at ground.	"Fineness"	Absolute Ceiling	Rate of Climb
G.A.X	9740	1004	583	11.25	9 7	105	90	12,400	825
Martin Bomber	10225	1070	832	10 3	9 6	103	93	12,250	630
Martin Transport	10225	1070	832	12 3	9 6	100	88	10,000	560
JN4 D-8	2016	355	90	22 6	5 7	73	66 5	6250	665
Loening Monoplane	2856	614	343	7 7	12 9	143 5	96	16900	1510
DH 4	4297	440	421	10.2	9 8	108 7	101	17,800	100
Spad 16-A	2884	328	240	12 1	8 8	116 5	104	15,400	860
Lepere Biplane	6774	501	420	9 6	9.5	133.5	107	20,300	1235
VE 7	2096	285	180	11 6	7.4	116 5	106	16,600	675
SE 5	2060	245	180	11 4	8 4	121 5	108	16,900	1040
Ordnance "D"	2432	261	341	7 1	9 3	147 0	103	23,005	1462
X.B 1 A	3590	405	342	10 5	8 9	125 5	109	20,665	1070
Thomas Morse MB 6	2094	250	325	6 3	8 5	159 5	110	24,300	1090
V C P 1	2666	269	337	7 7	10 0	154 0	114	27,000	1660
Thomas Morse S-6	1477	236	85	17.4	5.9	97 2	117	15,100	665

It is admitted that the assumption that "fineness" is constant over the range of values of Ky used and hence constant with altitude, is not rigidly exact. The variation of this factor with altitude would be included in the charts at the expense of needless complication, as its omission is not inimical to results with a margin of error of less than 3 per cent. Furthermore, any error arising from this assumption is modified to a negligible amount since the variation with altitude is included in the engine curves VI The fundamental purpose of the present chart is the comparative prediction of performances, and once a general engine-propeller curve is established from full scale flight results, the effect of an error in the above assumption is automatically reduced by using this empirically derived curve. It is at this point and in finding "fineness" empirically, that the difficulties of purely theoretical analyses of performance are obviated, or, rather, evaded

The engine-propeller curve can be further broken up to take into account the variations of the engine and the propeller performances separately, but this can only be effected after one or the other has been determined. A torque-meter being developed by Dr Geo de Bothezat at McCook Field will solve the problem of engine performance at altitude, and when test results are available the separation can be effected However, the small margin of error incident to the use of the present chart indicates that such a division of engine and propeller, with a consequent complication of scales, is not desirable, except for a special use of the chart in studying the exact efficiencies of various propellers.

Uses of the Speed Altitude Chart

Results of flight tests are now used in conjunction with the speed-altitude chart, first, to establish a table of "fineness" for as many airplanes as have been tested in flight, and second, to determine the dispositions of the curves VI of engine-propeller characteristics at altitude. Once these curves and a sufficiently long and varied table of "fineness" are available, it is proposed to choose a suitable "fineness" for an airplane of unknown performance but of known loadings per hp and per sq ft., and to then predict from the present chart, speed at all altitudes and, as will be seen, absolute ceiling The proper engine-propeller curve must necessarily be used

In Table I are listed all the airplanes on which flight test results are available, together with their main characteristics and "fineness". The method for determining the "fineness" of any airplane of known performance is the following Given such an airplane, its weight, area, r.p.m of the engine during high speed tests at zero altitude, the high speed, the horsepower of the engine at the observed r p m., the lb /hp and lb /sq ft. are determined. Referring to the chart, Fig 2, starting at a point 1 on "d" corresponding to the given high speed at zero altitude, move to point 2 on the zero line of curves III, next to point 3 which is on the proper lb /sq ft. line of curves I, then to point 4 on the zero line of curves II. A vertical line 4-5 is erected from this point Beginning now on scale "h" at point 6 of zero altitude, move horizontally to the left to point 7 which is always taken at 80 on scale "f" thence up to point 8 which corresponds to the given lb /hp on curves V, and then draw the horizontal line 8-9 The intersection with line 4-5 will be point 10, which lies among curves IV and determines the "fineness" of the airplane in question.

It will be noted that all of the engine-propeller curves correspond at zero altitude to a factor on "f" of 0.80, which means that in determining the "finenesses" in Table I, an arbitrary propeller efficiency of 80 per cent has been taken. Since this is consistently done, and the "fineness" of a new airplane is selected by comparison with the airplanes of Table I, small error can arise from the selected propeller efficiency of 80 per cent

Given the flight test results of speeds at all altitudes of the airplanes in Table I, the procedure in constructing the engine-propeller curves VI is the following The lb /hp. based on the horsepower corresponding to the r p m. of the engine at zero altitude is used throughout Given the lb /sq ft. and the speed at zero altitude, the "fineness" is determined as previously shown. Next, we will determine a point on the curve VI at say 5000 ft. Starting on scale "d" at point 11 corresponding to the high speed at 5000 ft from flight test, move to the point 12 on the 5000 ft. line of curves III, thence to point 13 corresponding to the proper lb /sq ft. line of curves I, thence to point 14 on the 5000 ft. line of curves II, then vertically to point 15 on the line of "fineness" previously determined, thence to the left to point 16 corresponding to the given lb /hp., and erect there a vertical line 16-17. This line will intersect in point 20 a line 18-19 drawn horizontally from the 5000 ft. point on scale "h" The point 20 is a desired point on the engine line of curves VI The same procedure is repeated for all altitudes at which flight test results are available. The engine-propeller curves of the Liberty 12 and the Hispano-Suiza 300 were obtained by averaging curves as given by the performances of the airplanes in Table I equipped with these engines.

The use of the chart may now be extended to the prediction of the performance of an airplane of which is known the weight, the area, the engine, and the structural characteristics. By comparison with the airplanes of Table I, a "fineness" may be chosen which is judged to be appropriate to the external proportions (wing truss, wing curve, chassis, fuselage) peculiar to the airplane under consideration Now to find the speed at any altitude it is only necessary to proceed through the chart from the left to the right, starting on scale "h" at say point 18, and proceeding through points 20, 16 ... 13, 12 to point 11 which is the speed desired If the curve VI of the particular engine used is not available, it will be necessary to select one of the given engine-propeller curves As more flight test data is available, engine-propeller curves for all engines in current use may be added to the chart.

As the altitude investigated approaches and reaches the absolute ceiling of the airplane, point 13 moves upward along the particular lb./sq ft. curve and the line 14-13 becomes just tangent to the apex of the lb /sq ft curve. So that if the speed-altitude chart is to be used in determining the absolute ceiling of an airplane, it is accomplished by starting successively at several points 18 corresponding to small increments of altitude, until an altitude is found at which the line 14-13 becomes tangent to the lb /sq ft curve. However, it will be possible to find absolute ceiling in a simpler manner which will be explained later.

Suppose that an airplane has been built and is ready for flight test, and that the engine-propeller curve of the engine used is already included on the chart If the airplane is given a speed-course test near the ground, and the r p m of the engine observed, then the lb./hp is known and the "fineness", the absolute ceiling and the speeds at altitude can be

as accurately determined from the chart as they can be by a complete flight test. The work of the flight testing branches can thus be considerably reduced. It will be shown in another section of the report how the remaining characteristics of performance can be secured without any additional flight testing

A further use of the chart in conjunction with flight testing is suggested. For instance, if two complete performances are determined for a given airplane, engine and pilots, but with different propellers, then two engine-propeller curves may be established, and by direct division, the relative efficiencies of the propellers at various altitudes and hence at various values of V/nD can be determined. Again, given two complete performances for a certain airplane, pilot and propeller, but with different engines, then by direct division of the resultant engine-propeller curves, the relative horsepower outputs of the two engines can be found at various altitudes. In this connection, it will readily be seen that here is a simple, accurate means for determining the horsepower delivered by an engine with a supercharger, as well as for predicting the performance of an airplane equipped with a supercharged engine, with characteristics either assumed or previously determined by the method herein outlined.

Practical cases often arise in which it is desired to know the effect on the performance of an airplane, of changing from its present engine of certain weight and horsepower to another engine of different characteristics. This change may result in a change in both lb /hp. and lb /sq. ft., one decreasing and the other increasing. In these cases, the present chart will give accurate results, quickly arrived at, whereas theoretical analytical methods would entail a mass of computation and a considerable time. Table I is especially valuable for the reason that the "fineness" factors are an exact indication of the relative worth of the airplanes when reduced to the same loadings. It shows that for the same loadings, the airplane with the higher "fineness" will give the better performance and that for the same performance, the permissible loadings are higher The "fineness" is an exact indication of the efficiency of an airplane as compared with any other airplane.

The chart has been extended to include very low horsepower loadings, high wing loadings and "fineness" factors as high as 130. Thus it serves as an indication of the limits of performance which it is possible to expect to attain when the lb./hp. of an airplane has been reduced to a minimum dependent on the weight per horsepower of engines, when the loading per sq ft. has been increased to a point where landing speed, stability or structural considerations limit it, and when the parasite resistance has been reduced to a minimum. The latter ideal has been approached by the Dayton Wright Gordon Bennett entry, a monoplane with no external bracing, a nicely streamlined fuselage, a retractable chassis and a "fineness" of 130 indicated by flight test results.

(To be concluded)

Directory of Air Service Activity

STATIONS AND ACTIVITIES UNDER JURISDICTION OF CHIEF OF AIR SERVICE

Akron, Ohio —Goodyear Tire and Rubber Co., District Office, Balloon Production and Inspection, Procurement Division.

Americus, Ga. —Americus Air Intermediate Depot (Souther Field), Supply Depot, Major L. S. Churchill

San Antonio, Tex —Brooks Field, Balloon School Airship Training, Balloon Cos. Nos. 4, 5, 6, 7, 11, Airship Co No. 16 Major J H Jouett.

Buffalo, N. Y. —District Office, Material Disposal and Salvage Div, 2050 Elmwood Ave.

Rantoul Ill —Chanute Field, A. S. Mechanics School, Maj G E Stratemeyer.

Arcadia, Fla. —Carlstrom Field, Pilots School, Maj R Royce.

Chicago, Ill —District Office, Procurement Div, Room 914, American Bldg, 36 South State St.

Buffalo, N Y —Curtiss Elmwood Air Reserve, Depot, District Office, Material Disposal and Salvage Div.

Detroit, Mich —Temp. Stor. Depot.

Fairfield, Ohio —Fairfield Air Intermediate Depot (and Wilbur Wright Field), Supply Depot, Stockkeepers School, Maj G E A. Reinburg

Houston, Tex —Temp. Stor Depot., Capt J. C Tips, Jr

Hampton, Va. —Langley Field, Airship Pilot School, U. S. Army School Aerial Photography. Airship Companies Nos. 10, 19. 50th 88th Sqdns. (Observation) Photo Section No. 7. Hdqrs. Det. 2nd Wing, Hdqrs. Det. 7th Group (Observation) Maj W N Hensley, Jr

Lee Hall, Va. —Balloon School, Balloon Companies Nos. 20, 22, 26, 28, 29, 30 Maj. J A. Paeglow

Little Rock, Ark. —Intermediate Supply Depot, Maj H. W Gregg

Long Island City, N. Y.—Long Island Air Reserve Depot, Aero Engine Plant District Office, Procurement Division.

Dayton Ohio —McCook Field, Experimental Field A S Engineering School, Maj. T H Bane.

Riverside, Calif. —March Field, Pilot School, Maj. B K Gount.

Middletown, Pa —Middletown Air Intermediate Depot, Supply Depot, Maj G. W DeArmand.

Montgomery, Ala —Montgomery Air Intermediate Depot, Repair Depot, Maj W J Fitzmaurice

New York, N. Y. —Starr & Borden Aves., L. I., N Y., District Office Procurement Div

Portland, Ore. —Couch Bldg., U S. Spruce Production Corp., Maj Jacob E Fickle.

Fort Sill, Okla —Post Field, A S. Observation School, Balloon Co, No. 23, Photo Section No. 4, Maj F Bradley.

Richmond, Va. —Richmond Air Intermediate Depot, Supply Depot. Maj W L. Moose, Jr

Coronado, Calif —Rockwell Field, Rockwell Air Intermediate Depot, Supply and Repair Depot, Border Patrol and Base Border operations of War Dept. Flying Field.

San Antonio, Tex. —San Antonio Air Intermediate Depot, Supply Depot, Maj W. H Garrison, Jr

Mt. Clemens, Mich. —Selfridge Field, Temp Stor. Depot, 1st Lieut. J. T. Hutchinson.

Washington, D. C. —Temp Stor. Depot.

STATIONS AND ACTIVITIES UNDER JURISDICTION OF CORPS AREA OR DEPARTMENT COMMANDERS

Sausalito, Calif. —Fort Baker, 9th C. A. Dist Balloon Co No. 24. 1st Lieut. F J. Durrschmidt.

†Everman, Tex. —Barron Field, Temp Stor Depot, Maj A. W Barry.

Fort Bliss, Tex. —Camp Bierne, Border Patrol Airship Co, No 8 1st Lieut. J W Shapstan.

Fort Bliss, Tex. —Fort Bliss Airdrome, Border Patrol Airdrome, Hdqrs. Flt "A" 13th Sqdn (surv) Photo Sec No 1

Anacostia, D. C —Bolling Field, 10th and 99th Sqdns (Observation), Maj M R Scanlon

Miami, Fla. —Chapman Field, Temp Stor Depot, 1st Lieut. J A Kase

Pampanga, P. I. —Camp Stotsenburg, Clarke Field, Aerial Coast Defense, 3d. Squadron (Observation) Photo Sec No 6

San Francisco, Calif. —Presidio, Crissy Field, Photo Sec No. 15 Casual Det Maj H H Arnold

Del Rio, Tex —Border Patrol Airdrome, Flt "A", 90th Sqdn 1st Lt E V Harbeck

Arcadia, Fla. —Dorr Field, Temp Stor Depot Maj R Royce.

Douglas, Ariz. —Douglas Airdrome, Border Patrol, Hdqrs and Flt "A" 12th Sqdn (Observation) 1st Lt. E D Jones

Houston, Tex. —Ellington Field, Temp Stor Depot Maj S W Cook.

Panama, C. Z. —France Field, Aerial Coast Defense, 7th Sqdn. (Obs.) Photo Sec No 12, Hdqrs. Det. 6th Group, (Obs.)

†Lake Charles, La —Gerstner Field, Temp Stor Depot 1st Lt. G E Brandhew.

Honolulu, Hawaii —Fort Kamehameha, Balloon Field, Balloon Co No. 21

Kelly Field, Tex. —Kelly Field Hdqrs 1st Wing Flying Field, Base Border Operations of 8th Corps Area Aviation Repair Depot Air Parks Nos 2, 4, 5, 11th, 20th 49th, 39th Sqdns (Bombardment) 17th, 27th, 94th, and 95th Sqdns. (Pursuit) Photo Sec No 2 Maj J N Reynolds.

Corregidor Island, P I. —Fort Mills, Kindley Field Aerial Coast Defense. Balloon Cos Nos. 17 and 27

C. Hampton, Va. —Langley Field Hdqrs Aerial Coast Defense, Flying Field, Maj W N Hensley, Jr

Laredo, Tex. —Border Patrol Airdrome, 1st Lt V J Meloy

†Hawes, Tex. —Love Field, Temp Stor Depot Maj H C Richards

Ford's Island, Pearl Harbor, Oahu, H T —Luke Field, Aerial Coast Defense, Photo Sec No 11

McAllen, Tex. —Border Patrol Airdrome 1st Lt V J Meloy

Marfa, Tex. —Border Patrol Airdrome, 1st Lt C Douglas.

Mills, Calif. —Mather Field, Flying Field Maj B M. Atkinson

San Francisco, Calif. —Fort Miley, Balloon Co No 14 1st Lt. W C Burns.

Garden City, L. I., N Y. —Mitchel Field, Hdqrs for A S Activities on Long Island Photo Sec No 14. Maj A. R Christie

Morrison, Va. —Temp Stor Depot, Maj A. N. Krogstad

Nogales, Ariz. —Border Patrol Airdrome, 1st Lt. R D Knapp.

Omaha, Nebr. —Fort Omaha, Balloon School Lighter-than-Air Experimental Research Balloon Cos. Nos. 9 and 12, Capt H C. White.

Millington, Tenn. —Park Field, Temp Stor Depot Maj J S Sullivan.

Manila, P I —Aerial Coast Defense. Maj E L Canady

Waco, Tex. —Rich Field Temp. Stor Depot 1st Lt. R. H Magee.

Arcadia, Calif —Ross Field Balloon School Balloon Cos. Nos. 1, 2, 13, 15, and 25. Lt Col T A Baldwin, Jr

Honolulu, Hawaii —Fort Ruger, Balloon Field, Balloon Co No 3

Sanderson, Tex. —Sanderson Airdrome, Border Patrol Airdrome, 1st Lt. M. Stenseth

Belleville, Ill. —Scott Field, Temp. Stor Depot Capt. J. H Houghton

ACTIVITIES UNDER JURISDICTION OF POST COMMANDER AT WHICH ACTIVITIES ARE STATIONED

Aberdeen Proving Ground, Md —Ordnance Proving Ground, Balloon Co No 18

Camp Benning, Ga. —Camp Benning, Infantry School of Arms Balloon Co No. 32 Maj. G E Lovell, Jr.

Camp Knox, Ky. —Godman Field, Artillery Firing Center, Balloon Co No 31 Capt. H B Flounders

Fayetteville, N. C —Pope Field, Artillery Firing Center 1st Lt. R K Stoner

CORPS AREA AND DEPARTMENT AIR OFFICERS

Maj L. H Drennan, 1st Corps Area, 99 Chauncy St, Boston, Mass.

Maj H L Watson, Second Corps Area, Governors Island, N Y

Maj A L. Sneed, Third Corps Area, Fort Howard, Md.

Maj H B Clagett, Fourth Corps Area, Fort McPherson, Ga

(Appointment pending), 5th Corps Area, Ft Benjamin Harrison, Ind

Maj W. C. McChord, 6th Corps Area, Fort Sheridan, Ill.

Maj J A Ryder, 7th Corps Area, Fort Crook, Nebr

Maj H C Pratt, 8th Corps Area, Fort Sam Houston, Tex

Maj H H Arnold, 9th Corps Area, Santa Fe Bldg, San Francisco, Calif (Temp)

Maj J F Curry, Hawaiian Dept, Honolulu, Hawaii

Maj R Walsh, Panama Canal Dept, Canal Zone.

Maj E L Canady, Philippine Dept, Manila, P I

† In process of abandonment.

N. Y.-Washington Air Mail Discontinued

The Air Mail route between Washington and New York was discontinued on May 31. The reason for the discontinuance of this route is given in an announcement of the Department as follows:

"This route has been kept in operation for a considerable length of time without serving any particular usefulness, either in connection with the mail service or in connection with experimental work, because it was felt that perhaps it would be possible to develop a long distance route between the principal New England cities and the large cities in the southeastern States, in which event the New York-Washington leg would be a very important part of the through route. However, our appropriations for the coming year will not permit of any such extension and there is no further necessity for our continuing the New York-Washington route as an experimental one because we have better opportunities for conducting the necessary experimental work on the New York-San Francisco route. In addition to this, of course there is the urgent necessity for economizing and not incurring any unnecessary deficit."

Postmaster General Hays in commenting on the discontinuance of this route said: "This is no way is to be construed as a lessening interest in, or a curtailment of, Air Mail development."

"Who's Who in American Aeronautics"

Every week, AVIATION AND AIRCRAFT JOURNAL prints the biographical sketch of men who are prominent in American Aeronautics. These sketches will be published later in pamphlet form. As so many of the officers change their stations often, it is believed that a semi-annual issue will be necessary. In compilations of this character many errors and omissions occur. It will be appreciated if corrections are sent to "Who's Who" Editor.

Ralph A. O'Neill

O'NEILL, RALPH A, Chief Mexican Air Force born Durango Mex Dec 7 1891 son of Ralph Lawrence O'Neill and Delores (Avila) O'Neill; married Priscilla Eileen Wilson Jan 31 1919

Educated: Primary private school El Paso high school Lehigh University non grad and 1919 special student

Professional: Eng Dept Int Smelting & Ref Co., Utah 1915 junior partner Kempton & O'Neill Customs Assayers, 1915 1919, Tech Rep., Hercules Powder Co. 1919 1920, Chief, Mexican Air Force, 1920 to date

Aeronautical Activities: Enlisted, Easington Pa, Aug 1917 U S S of M A, Sept 1917 R E C Flying, Nov 1917 overseas, March 1918, commissioned 2nd Lieut., Feb 7, 1918, Issoudun, April 1918 Toul Sector, May 1918, Chateau Thierry Sector, June 1918, Champaign Aire etc to Sept 1918, St Mihiel, Sept 1918 Argonne Oct to Dec 12, 1918 eight major engagements commissioned 1st Lieut Oct 19 1918 Flight Commander, June Sept, Squadron Commander Nov—Dec 90 official patrols over lines as Squadron Leader 89 official combats 9 Home Con... French 10th Army

War Honors: Four citations Distinguished Service Cross, July 2 1918 D S C Oak Leaf, July 5 1919 D S C Oak Leaf July 24, 1919 Gen Petain awarded Nov 28th Croix de Guerre with Palm winner of Tilton prize for first five American Aces July 1919, officially credited with five aerial victories

Member: Local Clubs social tennis, and golf

Present Occupation: Chief, Mexican Air Force

Address: Anglo South American Bank, Mexico City home 118 Somilla St Nogales Ariz

Charles J. Biddle

BIDDLE, CHARLES J. Lawyer born Andalusia Pa, March 13 1890 son of Charles Biddle and Louisa (Gibson) Biddle.

Educated: High School Philadelphia, Pa., A. B. 1911 Princeton University, LL. B. 1914 Harvard University

Professional: Attorney at law (several years) 1914 1917 1919 to date.

Aeronautical Activities: Training in French Aviation Schools April 19, 1917 to July 28 1917 French Air Service July 1917 to Jan 12 1918 in U S Air Service, Jan 12 1918 to Dec 1918 American Aces, officially credited with destruction of 7 enemy airplanes

Flying Rating: French Pilot Aviator (Military) Reserve Military Aviator

War Honors: Distinguished Service Cross, two letters of commendation from Commander in Chief A E F French Legion of Honor and Croix de Guerre with four palms Belgian order of Leopold (rank of Chevalier)

Books: "The Way of the Eagle"

Member: Aero Club of France, Aero Club of America Philadelphia Princeton Colonial Club Philadelphia

Present Occupation: Attorney at Law

Address: 500 Chestnut St, Philadelphia, Pa home Andalusia Pa

Lauritz G. Haugen

HAUGEN, LAURITZ G. Major Air Service born Northwood, Iowa April 20 1893, son of N Haugen and Bertha (Svenson) Haugen.

Educated: Northwood, Iowa, Shattuck Military School, Faribault, Minnesota, LL. B., 1916, Georgetown University Law School

Professional: Attorney, Secretary of Committee on Agriculture, House of Representatives, Washington, D. C.

Flying Rating: Reserve Military Aviator

War Service: Aide to Major General Kenly, Director of Military Aeronautics, Secretary Promotion Board of Air Service, Secretary of Joint Army Navy Board on Aeronautic Organization.

Present Occupation: Secretary, Committee on Agriculture, House of Representatives

Address: House of Representatives, Washington, D C, home, Northwood, Iowa.

Jesse Orin Creech

CREECH, JESSE ORIN Commercial Aviator born, Harlan N Y Aug 22, 1890, son of Wm Creech and Martha Creech.

Educated: Public schools of the District of Columbia McKinley Manual Training High School D C, attended University of Kansas and Cornell University

Professional: Scientific work U S. Dept. of Agriculture in Utah, U S Shipping Board Sales Dept Indian Refining Co., N Y

Aeronautical Activities: Canada July 10 1917 to Oct 10, 1917 Texas as instructor Oct 10, 1917 to Dec 15 1917 England and France Jan 10 1918 to March 10 1919

Flying Rating: Reserve Military Aviator

War Service: Attached to British Flying Corps from July 10 1917 to Nov 9 1918 flew Camels with 148th Squadron at the front American Ace, officially credited with destruction of 9 enemy airplanes

War Honors: British Distinguished Flying Cross recommended for the U S Distinguished Service Cross and Oak Leaf

Member: Aero Club of America

Present Occupation: Organizing an Aero Club at Lexington Ky

Address: 252 Madison Place, Lexington, Ky

Henry B. Crewdson

CREWDSON, HARRY B. Exhibition Pilot born Custer Co. Nebr March 22 1884 son of E D Crewdson and Mary (Muir) Crewdson

Educated: Public schools and high school

Professional: Worked for Lord and Thomas Advertising Agency, Chicago, Ill., 2 years Harper and Bros Publishers 3 years F R White Advertising Agency, 2 years Marshall Field & Co., Chicago Ill

Aeronautical Activities: Flying for 10 years, built four machines flew exhibition for William Pickens W F Barnes Amusement Co., Wilkins Aviators, Robinson Amusement Co., Howell Aviation Co., Western Vaudeville all Chicago booking agencies, and several others before the war

Flying Rating: I. F. of A. license also Expert Pilot's license

War Service: Civilian flying instructor fall of 1918 to Jan 1, 1919

Present Occupation: Carrying passengers, instructing etc

Address: Great Northern Hotel, Hot Springs, Ark

Eugene Burlingame Meehling

MEEHLING EUGENE BURLINGAME Student born Denver Colo., March 5 1897 son of David L Meehling and Fannie (Burlingame) Meehling

Educated: Clayton School and East Denver High School 1915-1917, Electrical Engineering University of Colorado Mass. Inst of Tech., 1919 to date

Aeronautical Activities: U S School of Military Aeronautics, Berkeley Calif primary flying training Rockwell Field formation flying Payne Field pursuit and gunnery instruction, Carlstrom and Dorr Fields instructor in aerial gunnery Carlstrom Field Pilot, Johnson Aerial Transportation Co., Denver Colo.

Flying Rating: Reserve Military Aviator, F A I Pilot.

War Service: Army Oct 1917 to April 1919

Present Occupation: Student

Address: A 408 Mass Inst of Tech., Cambridge Mass. home, 1149 Vine St., Denver Colo

Gayen Leroy Kennedy

KENNEDY GAYEN LEROY Automobile Salesman born Wright City, Mo Feb 14 1892 son of Gayen A Kennedy and Emma (Hayes) Kennedy

Educated: Public schools of Wright City, Mo

Professional: With American Car and Foundry Co St Louis Mo., 1910-1912 Secretary, Georgia Auto Club and Supply Co Savannah Ga., 1919-1921

Aeronautical Activities: Trained at Camp Dick, Carlstrom Field, Dorr Field, Barron Field, Gerstner Field

Flying Rating: Reserve Military Aviator

War Service: Army, Dec 1917 to Jan 1919

Present Occupation: Retail automobile sales

Address: 222 Drayton St. home, 12 West Hull St., Savannah, Ga

Henry Bourne Joy

JOY HENRY BOURNE Capitalist born Detroit, Mich Nov 23 1864 son of James F Joy and Mary (Bourne) Joy married, Helen Hall Newberry Oct 11 1892

Educated: Orchard Lake Military Academy 1882 Phillips Academy Andover Mass Sheffield Scientific School, Yale University

Professional: Mining in Utah railroad terminal construction work freight car building gas engine engine (Marine in 1893 and 1894) Chief Boatswain's Mate in American Navy Spanish War Beet Sugar factory built in 1900 1909 established Packard Motor Car Co in Detroit, head of it until World War

Aeronautical Activities: Beginning of World War started Packard engineering work to develop air motor of "bogey" capacity

War Service: Enlisted in Navy as Seaman in April 1898 (Spanish War) rated Chief Boatswain's Mate served throughout the war on U S S Yosemite In World War was commissioned Captain, Signal Corps Regular Army commissioned Lt Col Signal Corps Regular Army organized four motor mechanics regiments

Member: Detroit Athletic Club New York Yacht Club Engineer's Club N Y Banker's Club N Y Larchmont Yacht Club

Present Occupation: Capitalist

Address: 1740 Penobscot Bldg Detroit home, 301 Lake Shore Road Grosse Pointe Farms, Mich

Jacob W. S. Wuest

WUEST JACOB W S Major Air Service; born Cincinnati Ohio June 24 1880 son of Charles Wuest and Julia (Rapp) Wuest married, Helen E Strong May 27 1916

Educated: Public schools of Cincinnati, Ohio; U S Military Academy 1909.

Aeronautical Activities: U S Balloon School, Ft Omaha Nebr, May Aug 1919, School of Aerial Observers, Ft Sill, Okla. Aug.—Sept, 1919 commanding U S Balloon School, Ft Omaha, Nebr and Experimental Station for Lighter-than Air Craft, Ft Omaha, Sept. 1919 to Sept. 1920

Flying Rating: Aerial Observer July 1919, Junior Military Aviator July 1919

Member: Aero Club of America Omaha Athletic Club

Present Occupation: Student, General Service Schools Ft Leavenworth, Kans

Address: Ft Leavenworth, Kans. home College Hill, Cincinnati Ohio

Lyman J. Seely

SEELY, LYMAN J. Manufacturer born, Detroit, Mich, Nov 4 1877, son of James M Seely and Mary E (Tremaine) Seely; married, Marguerite Woodworth Sept 20, 1909

Educated: Public schools of Rochester, N Y; Dulwich preparatory school, London, England; University of Rochester

Professional: Took up newspaper work in 1902 became interested in Elbridge Engine Co, Rochester N Y in 1907 President and proprietor of Elbridge Engine Co until 1913 joined G H Curtiss as sales and publicity manager Curtiss Aeroplane and Motor Companies, until 1917 purchased Hammondsport plant in 1919 and organized Keuka Industries, Inc

Present Occupation: President of Keuka Industries, Inc and of Steuben News, Inc

Address: Lake Street, Hammondsport, N Y

Harry M. Rinker

RINKER HARRY M. Airplane Pilot born Wakeeney Kans March 1 1891 son of James M. Rinker and Virginia E Rinker married Marjory Gibson Jan 6, 1918

Educated: Public schools Kansas University

Aeronautical Activities: Commercial flying since discharged from army passenger service, photography exhibition and advertising

War Service: Ground school, Austin Tex, and Camp Dick flying training, Ranbrook Field, Wilbur Wright Field, Payne Field, Gerstner Field Barron Field Post Field

Flying Rating: Reserve Military Aviator

Member: Aero Club of America.

Present Occupation: Commercial Flying

Address: Wakeeney Kans.

Carlyle LaMar Nelson

NELSON, CARLYLE LaMAR, Secretary to the Governor, State of Utah born Manti City Utah, June 3 1895, son of Andrew C Nelson and Amanda (Jensen) Nelson

Educated Salt Lake City Public Schools, University of Utah Columbia University

Professional Newspaper writer 1916-1917, two years in military service. Secretary Republican State Committee of Utah Nov 1919 to Nov 1920 Secretary to Governor of Utah, Jan 1921

Aeronautical Activities Short service in commercial flying in United States immediately following return to U S

Flying Rating Reserve Military Aviator

War Service Ground School University of California overseas service March 1918 to May 1919 attached to Escadrille 131 Groupe de Bombardement No 4 French Army July 1918 to Nov 1918 pilot in day bombardment service at the front (five major campaigns); attached to 100th Squadron, U S 2nd Army, Nov 1918 to April 1919

War Honors Croix de Guerre, two citations, Ordre d'Escadre, Ordre d'Armee

Citation "Attached to Bombardment Group No 4, he has given under all circumstances proof of a devotion unlying and remarkable bravery On the 12th of September 1918 he accomplished two successive bombardments, machine-gunning from a very low altitude in terrible weather He surprised and set on fire an enemy drachen On the 14th of September in the course of a bombardment of a great railroad station a long distance from the front, he engaged in a terrible combat against enemy pursuit planes three times superior in number He brought one of his adversaries down in flames."

Member Aero Club of America President, Aero Club of Utah

Present Occupation Secretary to the Governor, State of Utah

Address State Capitol home, 840 Park Street, Salt Lake City Utah.

Fay Leone Faurote

FAUROTE FAY LEONE, Advertising, born Terre Coupe, Ind July 16 1891 son of George L. Faurote and Emma J Faurote married Ethel E Bacon June 18 1917

Educated Niles Mich public schools B S (M E) 1908 University of Michigan

Professional Electrician, Niles, Mich. Asst Experimental Engineer Olds Motor Works, Detroit, Mich Advertising Manager Olds Motor Works Advertising Manager F B Stearns Motor Car Co Dodge N Y head of Copy Department Chas Pattee Co (Automotive Advertising) Director of Plans B F McCann Co Detroit Mich Manager Detroit Office R F Loane Co Department of Ed International Sales Promotion Curtiss Aeroplane & Motor Corp, Curtiss Aeroplane Co, Curtiss Exhibition Co; Editor Aircraft Year Book, Editor Curtiss Flyleaf, Curtiss Aeronautical Book

War Service Manager all educational and welfare work at nine plants and four flying fields Curtiss Aeroplane & Motor Corp and subsidiary companies member Naval Recruiting Committee, Buffalo district.

Books Co-author with Arnold Ford Motors and Ford Shops Author The How and Why of the Automobile, Many Man's Text Book on Automobiles Modern Aeroplanes

Member Society of Automotive Engineers

Present Occupation Educational and advertising campaigns writer automotive subjects

Address 112 East 19th Street New York N Y home 112 Wellington Road Garden City L I N Y

Charles Goodwin Williams

WILLIAMS, CHARLES GOODWIN Aeronautical Engineer, born, Chicopee, Mass. Sept 10 1876 son of Charles J Williams and Sarah Ann (Goodwin) Williams married May Van Hyning 1910

Educated Public schools and business college of Springfield, Mass International Correspondence schools 1900, Dept. of Tech.

Professional Ordnance Engineer U S Armory Springfield Mass, Rock Island Arsenal, Ill U S Ordnance Engineer in China during Boxer Rebellion Experimental Engineer, International Harvester Co. Aviation Superintendent, Indian Motorcycle Co Springfield Mass

Aeronautical Activities Designer of Air Cooled Rotary Aviation Engines for Indian Motorcycle Co 1911 Chief Inspector airplanes and airplane motors U S Signal Corps 1916, stationed at Hammondsport, N Y Buffalo N Y, Ithaca, N Y and Berkeley, Calif 1917 engineering production of Liberty Engines, Detroit, Mich 1918 1919 in the A. S. A. P. L, Engineering Division McCook Field

Present Occupation Air Service Representative Ordnance Engineering Corp., Baldwin, L I

Address Engineering Division McCook Field, Dayton Ohio

Edward Andrew Deeds

DEEDS, EDWARD ANDREW, Automobile Business born Granville Licking County, Ohio March 12 1874 son of Charles Deeds and Susan C (Green) Deeds married, Edith Walton, March 1900

Educated County District School, Granville, Granville Academy, Denison University Cornell University

Professional Draftsman, The Thresher Electric Co Construction and Maintenance Engineer The National Cash Register Co President, The Domestic Engineering Co President, The Smith Gas Engineering Co Chairman Miami Conservancy Board

Aeronautical Activities Civilian member, Munitions Standards Board in 1917 member, Aircraft Production Board later in charge of Production Division of Aircraft Board

War Service Commissioned Colonel in regular army 1917, in charge of Production Division of Aircraft Production Board, March 1908 to Feb 1921

Member Society of Automotive Engineers, Cleveland Aviation Club Dayton Engineers' Club Engineers Club of New York American Institute of Engineers American Electro-Mechanical Society American Institute of Electrical Engineers Army and Navy Club American Legion

Present Occupation President, The Delco-Light Co President, The Smith Gas Engineering Co

Address 807 Mutual Bldg home, Moraine Farm Dayton, Ohio

Porter Hartwell Adams

ADAMS, PORTER HARTWELL, Experimental Engineer born, Andover, Mass. Aug 10, 1894 son of Charles A Adams and Jeannie H (Porter) Adams

Educated Clark School, Pasadena, Calif Chauncey Hall School Boston, Mass University of Redlands (Calif) Mass Inst. of Tech

Professional Engineer and General Manager Basic-Adams Engineering Co Boston Mass from 1915 until beginning of the World War assistant to Warren Noble N C L Engineering Corp, 1919 1920

Aeronautical Activities Special work for Connecticut Aircraft Co and Cooper Aircraft Co 1915 flying, 1915 in Los Angeles Calif, special work with D W Douglas Consulting Engineer American Aerial Corp Boston Mass., working on large type passenger ships for Boston-New York service 1920 1921

War Service Ensign, U S Naval Reserve, in charge of Office of Naval Intelligence Rock land Me 1917 1918 Aide to the Commandant, U S Naval Air Station, Chatham Mass 1918-1919

Member Junior A S M E Junior member Society of Automotive Engineers Engineer's Club of Boston Aero Club of America (N Y)

Present Occupation Technical and Industrial Banking Experimental Engineering

Address 107 Green St home, 2 Commonwealth Ave, Boston, Mass

Stuart Flenniken Stilwell

STILWELL STUART FLENNIKEN, Automobile business born Carmichaels, Pa, May 7 1889 son of George A Stilwell and Mary F Stilwell married Charlotte W Stauffer March 3 1918

Educated Carmichaels Public and High Schools

Professional Selling automobiles

Aeronautical Activities Ohio State University Ground School Texas University Ground School 1918 Cadet Kelly Field No 2 Completed training May 8 1918

Flying Rating Pursuit Pilot, License No d575

War Service Jan 1918 to May 1919

Present Occupation Automobile Salesman

Address Keystone Auto Corp home, 75 Butt Ave Uniontown, Pa

Ira Longanecker

LONGANECKER, IRA Major Air Service born Goshen Ind Feb 16, 1880 son of Jacob Longanecker and Angeline H Longanecker

Educated Elkhart Co Grade Schools Nappance Ind High School

Professional Graduation from High School in 1898 short period in teaching and mercantile business from 1898 to 1903 1903 enlisted in army

Aeronautical Activities: Detailed in Aviation Section Signal Corps, Nov 1917 began pilot training April 1918 Commander Gerstner Field June to Nov 1918

Flying Rating Junior Military Aviator

War Service Service, Washington D C, Nov 1917 to April 1918 Gerstner Field, April 1918 to Nov 1918 Selfridge Field Chanute Field

Present Occupation: Air Officer 5th Corps Area

Address Fort Benjamin Harrison, Ind

G. Edward Barnhart

BARNHART, G EDWARD, Consulting Aeronautical Engineer, born, Pasadena, Calif, July 31, 1888, son of Clyde Chassel Barnhart and Mamie E (Alsop) Barnhart, married, Ella Blanche Little, July 28, 1917

Educated Public schools of Pasadena, Calif, Throop Polytechnic Institute

Aeronautical Activities 1909 to 1910, designed, built and flew experimental gliders, 1911-1912, designed and built a pusher biplane, had first flying experience and learned to fly this machine. The machine was later sold to the Mills Aviators of Chicago 1912 1914, with Glenn L. Martin Co., Los Angeles Calif., experimental building, engine adjustment and field work in connection with airplane building and designing, June 1914 to Nov. 1914, designed and built two pusher biplanes and two monoplanes 1914 to 1916, with Curtiss California Airplane Co., San Diego, Calif., as experimental aeronautical engineer and airplane constructor 1916 to Aug 1917, with the U S Signal Corps Aviation School, San Diego Calif Aug 1917 to May 1918, Wilbur Wright Field as Aeronautical Mechanical Engineer and Research Engineer for that field May 1918 to March 1919, with Standard Aircraft Corp Elizabeth, N J as assistant to the Vice President and Consulting Engineer and later as Chief Engineer in charge of Handley Page engineering department, March 1919 to Oct 1919 Experimental Engineer, B F Goodrich Co, Akron Ohio Oct 1919 to Jan 1920 inspection of aviation fields Jan 1920 to April 1921, with C Robert Little, Pasadena, Calif., as Consulting Aeronautical Engineer

Books D M A Mechanics Training Information for the A, B and C course

Member Associate Fellow, Royal Aeronautical Society of Great Britain Junior member, American Society of Mechanical Engineers, American Society for Testing Materials, Society of Automotive Engineers, Aero Club of Southern California

Present Occupation Consulting Aeronautical Engineer

Address 44 W Green St. home, 151 Marina Ave. Pasadena, Calif

Harry Perry De Coster

DE COSTER HARRY PERRY Commercial Aviation born San Antonio, Tex., Dec 10 1895 son of Harry W De Coster and Ida (Perry) De Coster married, Selma Johanson, Aug 26, 1918

Educated Abbott School, Farmington Me Hebron Academy University of Maine

Professional With Fiske Rubber Co., Chicopee Falls, Mass

Aeronautical Activities Training at Love Field student of Gosport System and assigned to the field as instructor of instructors Brooks Field installed Gosport Organization and Training at Rich Field civilian flying pilot for the Eastern Aircraft Corp.

Flying Rating Reserve Military Aviator Gosport Instructor

War Service April 1917 to Jan 1919

Present Occupation Operations Manager The Eastern Aircraft Corp.

Address 540 First Street, So, Boston, Mass. home 76 Glenville Ave, Allston, Mass

Frank Rollins Maxwell, Jr.

MAXWELL FRANK ROLLINS, Jr. Shoe Business, born Boston Mass, April 9, 1888 son of F R Maxwell and E W Maxwell, married, Elma Lee Jefferson May 28, 1918

Educated Public schools, Volkmann School, Boston A B 1910 Harvard University

Professional Shoe manufacturing

Aeronautical Activities Trained as Naval Aviator (L T H) at Pensacola, Fla. to 1918

Flying Rating Naval Aviator

War Service Commissioned Ensign, June 15, 1918 Lieut Oct 1 1918 Aide-to-Commandant, U S Naval Air Station, Pensacola, Fla June 15 1918 to Jan 15 1919 communication officer and aide for information

Member Harvard Club of N Y Eastern Yacht Club Dedham Polo and Country Club Union Boat Club

Present Occupation: Shoe Manufacturing

Address 21 Court St Dedham, Mass.

William George Bonelli

BONELLI WILLIAM GEORGE Rancher, born Kingman, Ariz, Nov 5, 1895, son of George A Bonelli and Effie Ellen (Tarr) Bonelli

Educated Public and high schools of Kingman Ariz, A B University of Southern California

Professional 1916-1918 Manager, mercantile business 1919 to date Superintendent, cattle ranch Chloride Ariz

Aeronautical Activities Flying training at March Field June 1918 to March 1919

Flying Rating Reserve Military Aviator

Member Aero Club of America

Present Occupation Superintendent, cattle ranch

Address Chloride, Aris.

Notice to Airmen (Canada)

The Air Board of Canada notifies the following:

New Airport

Moose Jaw, Sask., Customs Airharbour (Lat. 50 24′ N., Long 105 34′ W), situated in Lynbrook Heights, addition to the City of Moose Jaw Altitude 1865 ft. above sea level. Dimensions 400 yd. N and S, 700 yd. E and W. Licensed for use by day only and marked with a square and circle divided in equal parts by a vertical line, thus Φ

Customs personnel on duty when notified at the Collector of Customs' Office, Moose Jaw. Directional wind indicator on western side of aerodrome Telephone connection and water supply. There are facilities for repair, fuel supply and machine accommodation, and a handling party stationed at the airdrome.

Available communication to city electric railway adjoining airdrome. Good roads.

Licensee City of Moose Jaw, Sask.

Operated by the Western Aeroplane Co, Ltd., Moose Jaw, Sask —*Notice to Airmen No 6*

Struts Rotting in Lower Sockets

1 In several instances recently it has been noted that the lower ends of wooden interplane and center-section struts have rotted in the sockets, due to prolonged exposure of the aircraft to the weather under winter flying conditions.

2. The attention of Air Engineers is, therefore, directed to the necessity of a careful examination of this portion of all such struts.

3 The tendency of the strut end to rot can be materially reduced by providing some arrangement to prevent water from entering the socket, thus obviating constant contact between moisture and the end grain of the strut

4 (Authority Air Ministry Notice to Ground Engineers No 18 of the year 1921)—*Notice to Air Engineers No 1, 1921.*

Laminated and Built-Up Spars

In all cases where airplanes have laminated or built-up spars, these are to be examined for opening up of glued joints. If a joint has only opened up an inch or two the spars should be bound with glued tape and varnished, but if the opening extends along the spar or if there are several bad places on one spar, then that spar must be scrapped. This action has been necessitated by the fact that bad cases of this sort have been found on airplanes in service.—*Notice to Air Engineers No 3, 1921*

(With reference to the above notices it may be noted that some of the Canadian terms differ not only from those used in the United States but also from the terms in use in Great Britain Canada has introduced the term "airharbor" for airport, which latter seems to us more convenient on account of its greater brevity The Canadians also call ground engineers "air engineers", which might lead to some confusion the day when large aircraft will carry among their crew licensed engineers in charge of the power plant. An agreement on such and similar terms as far as they affect English speaking peoples would therefore appear highly desirable. EDITOR.)

U. S. Civil Service Examinations

The United States Civil Service Commission announces open competitive examinations for the positions listed below.

Airplane Mechanic's Helper (Engines), $1,000 to $1,400 a year

Airplane Mechanic's Helper (Fuselage and Rigging), $1,000 to $1,400 a year.

Airplane Mechanic (Engines), $1,200 to $1,800 a year.

Airplane Mechanic (Fuselage and Rigging), $1,200 to $1,800

All these positions are for vacancies in the Air Mail Service of the Post Office Department. Appointees whose services are satisfactory may be allowed the increase granted by Congress, which is 15 per cent for salaries ranging from $1,600 to $1,500 a year, and 10 per cent for salaries ranging from $1,600 to $2,200 a year.

Applicants must be United States citizens. Receipt of applications is to close June 28, 1921.

The Postmaster General Flies

Ever since taking office Postmaster General Will Hays wished to familiarize himself in a practical way with the workings of the Air Mail Service. On May 21 his long standing wish was fulfilled when Brig-Gen. William Mitchel, Assistant Chief of Air Service, piloting a DH-4B, carried him from Washington to Mineola, Long Island, along the route flown by the Air Mail fliers.

On stepping from the machine, the Postmaster General

POSTMASTER GENERAL HAYS AND BRIG. GEN. W MITCHELL BEFORE THEIR FLIGHT FROM WASHINGTON TO NEW YORK

declared that his trip had been instructive, but he did not commit himself beyond that statement, except for saying that he was going to take the train back to Washington.

The First Airway Guide

Nothing could better illustrate the constant progress made by the European air lines than the appearance of the first airway guide, which is just at hand. This guide, called *L'Indicateur Aérien* was issued by our Paris contemporary *L'Air* and is to appear on the first of every month. Its first issue is a pamphlet of 24 pages which contains the time tables of the French air lines, the business addresses of the operating companies, the passenger and freight rates, the postage required for air mail service, and many other valuable pointers on public air transport.

It is significant of the manner in which the French are boosting commercial aviation that several of the air transport companies listed in the guide allow reduced fares to certain classes of travelers. Thus the Franco-Bilbaine grants a 50 per cent reduction on the fare of government officials, diplomatic agents, army and navy personnel, and representatives of firms. The Franco-Roumaine, which runs the Paris-Prague-Warsaw service, makes the same reduction, but also includes journalists in this class. This company furthermore grants a 10 per cent reduction to members of the Pilot-Aviators League, the Aeronautical League, the Aero Club of France and several other associations. On the Toulouse-Casablanca service, which is operated by the Latecoere Line, members of the French and Spanish Aero Clubs are granted a 50 per cent reduction.

The second issue of *L'Indicateur Aérien*, which is to appear in June, will be international in scope. It will list all the air transport services operating in and outside of France.

Reserve Pilots' Training Camp

On June 1 the first annual two weeks practice period for reserve Air Service pilots for the Third Army Corps Area was inaugurated at Camp Atwood, N. J. This area embraces the states of Pennsylvania, New Jersey, Maryland, Virginia and West Virginia and the District of Columbia.

Landing Field Notes

Milford, Iowa

Milford, Iowa, has a permanent airdrome one-half mile N of Milford and one-half mile S of Lake Okoboji. This field which is operated by Donaldson Bros. Aero Show, agents for Curtiss airplanes and exhibition contractors, was opened in January 1919 Visitors are always welcome There is a large hangar on the field which accommodates six airplanes and facilities are available for all kinds of repair and overhaul work.

Hartford, Conn.

The first municipal landing field in any Eastern City has now been completed at Hartford, Conn., and has already been visited by a number of fliers. The city has so far expended more than $15,000 to put the field in condition and, aside from providing supplies of gasoline and oil, the field also offers to fliers the accommodations of a club house. An attendant is kept constantly on guard. The Hartford municipal aviation commission wishes it understood that fliers from any place, at any time, are welcome to "drop in" on the field

Recently several army fliers from Framingham, Mass., visited the Hartford field and pronounced it one of the finest they had flown on. There is a total space of 100 acres and the aviator has a straight away run across the field of 2,000 ft in one direction and 1,800 in the other Markers are now being installed and, aside from the usual symbols for the information of the flier, the word HARTFORD will be spelt out in white concrete The customary wind direction cone and other safety appliances are provided

Hiram Percy Maxim, inventor of the Maxim silencer, is chairman of the municipal aviation commission in Hartford and is also president of the Aero Club of Hartford, established in 1909 Aviators visiting Hartford should phone Mr Maxim or one of the other aerial commissioners. They will find a cordial welcome. Mayor Brainard of Hartford and other municipal officials are decidedly friendly toward flying and are cordially assisting the aviation commission

Fliers intending to visit Hartford whenever possible should drop a line in advance of their arrival addressed to "Aviation Editor - Hartford Courant," and that newspaper, the largest morning paper between New York and Boston, will see that their coming is heralded

Staunton, Va

Staunton, Va., has put itself on the aerial map by establishing a municipal landing field in accordance with U S Army Air Service specifications. E W Opie of the aviation landing field committee of the Chamber of Commerce has sent in the questionnaire which gives the following statistics

Name of field, Lyle, shape and dimensions in feet, 650 x 400, direction of long axis, North-South, Markers, according to A. S. specifications; Contour of field, hilly on west side, slight rise to north, with level runway in center landing possible in wet weather; slight rise and rocks at north end, low fence around entire field, telephone wires at south end, ditch on east side, but all at such distance from runway as to be negligible, according to pilots who have used field. Small airdrome would be possible, high grade of supplies available at Beverly Garage, ¾ mile from field in business section. Field located on northern outskirts of town, about one mile north-west of intersection of Chesapeake and Ohio, and Valley Branch of Baltimore and Ohio Railroads. Altitude above sea-level, 1,600 ft. Staunton and Augusta Chamber of Commerce is operating field, Charles B Ralston, Secretary, official interested. Field open to all pilots; Lynchburg Air Service Corp., Lynchburg, Va., now using this field

Rochester, N. Y.

Authorization of a note issue of $125,000 to provide funds to pay for the Scottsville road aviation field at Rochester, N Y and the municipal wharf at Summerville was made recently by the Rochester Common Council. Fifty thousand dollars will care for the aviation field while the remainder of the money will be used for the wharf project.

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